ControlSpace® Serial Protocol v2.6b

The ControlSpace serial protocol specifies the commands that can be used to communicate with the ESP-88 and the ESP-00 via the built-in serial port or over a TCP/IP connection using serial-over-ethernet. The original protocol (v1.xx) supported a limited number of commands that provided access to parameter sets, groups, and the input and output blocks. In version 2.xx, this protocol has been significantly expanded to allow direct access to any of the signal processing blocks using the Set/Get Module Parameter commands (SA & GA).

Note: The new SA/GA commands use a different format for specifying level than was used in the original protocol. SA/GA commands use *absolute* values, e.g. to specify -28 dB, "-28" is used. The original commands, e.g., SV to set volume, use *relative* levels, e.g. to specify -28 dB, "40" is used (64 decimal).

1. Connection

Using the Serial Port

The default serial port settings are 38,400 baud, 8-bits, 1 stop bit, no parity, and no flow control. These settings can be changed via the Network Setup tool in ControlSpace Designer.

- A crossover cable is required to connect between the ESP and a PC.
- At start-up, the ESP will send the string "Ready"

Using Serial-over-Ethernet

Serial commands can also be sent over Ethernet using a TCP/IP connection. The ESP uses a fixed port number which is '10055' and once a connection is established to this port all serial communication is then routed through it and the serial port is disabled. This port will only support one connection, but is independent to the ports used by the ControlSpace Designer software which can be on-line at the same time. It should be noted however that the TCP/IP connection will be lost when uploading to or downloading from the ESP and will need to be re-established.

2. Commands

All commands and responses are sent in ASCII, terminated with <CR> (carriage return; 0D hex). There is no time limit between characters of a command so it is possible to enter these commands using a "dumb terminal". All numbers (except for the SA/GA commands) are entered using hexadecimal ASCII. For example 16 decimal is entered as 10, 34 decimal is entered as 22.

- Command should be 2 capital letters.
- A space after the command is optional, e.g. SS 10 or SS10 are both acceptable
- A comma "," is used as the separator
- Hexadecimal values should not have suffix, e.g. "A3h" not allowed – should be "A3".

Command Summary

Version 1.x Commands:

1.1 Set/Get Preset (SP, GP)
1.2 Set/Get Parameter Set (SS, GS)
1.3 Set/Get Volume (SV, GV)
1.4 Set/Get Mute State (SM, GM)
1.5 Set Volume Increment/Decrement (SI)
1.6 Get Level, in dBFS (GL)
1.7 Set/Get Group level (SG, GG)
1.8 Set Group Volume Increment/Decrement (SH)
1.9 Set/Get Group Mute State (SN/GN)

Additional Version 2.x Commands:

2.1 Set/Get Module Parameter (SA, GA)
2.2 AMX Device Discovery Response (AMXB)
2.3 Set/Get IP Address (IP)

1.1 Set/Get Preset

Recall preset ***n***:

SP ***n*** where ***n*** = 1 – 10h {1 – 16 decimal}

Get currently set preset:

GP

Response:

P ***n*** where ***n*** = 0 – 10h { ***n*** =0 means no preset is set}

Example, Recall preset number 5

SP5<CR>

1.2 Set/Get Parameter Set

Recall parameter Set ***n***:

SS ***n*** where ***n*** = 1 – FF {1 – 255 decimal}.

Get currently set parameter Set:

GS

Response:

S n where n = 0 – FF { n =0 means no parameter set is set}

Example: Recall parameter set 5

SS5<CR>

Query for last invoked parameter set:

GS<CR>

Reply from ESP88:

GS5<CR>

1.3 Set/Get Volume

Set level of Input/Output channel of slot ***s***, channel ***c***, to level ***l***:

SV ***s,c,l*** where ***s*** is the slot number, 1 – 8;
c is the channel number, 1 – 8;
l is the level, 0 – 90h {0 – 144 decimal; 0 = -60dB, 1 = -59.5dB, … 8Fh = +11.5dB, 90h = +12dB}

Get level of Input/Output channel (GV command) of slot ***s***, channel ***c***:

GV ***s,c*** where ***s*** is the slot number, 1 – 8;
c is the channel number, 1 – 8;

Response:

GV ***s,c,l*** where ***scl*** are same as above

Note: Set Volume commands will be ignored if the channel is muted.

1.4 Set/Get Mute

Set mute state of Input/Output channel of slot ***s***, channel ***c***, to state ***n***:

SM ***s,c,n*** where ***s*** is the slot number, 1 – 8;
c is the channel number, 1 – 8;
n is state: M = mute, U = unmute, T = toggle mute state

Get mute state of Input/Output channel (GM command) of slot ***s***, channel ***c***:

GM ***s,c*** where ***s*** is the slot number, 1 – 8;
c is the channel number, 1 – 8;

Response:

GM ***s,c,n*** where ***scn*** are same as above

Examples

Set input slot 5 channel 1, to Mute `SM5,1,M<CR>`

Query for mute status of slot 2 channel 3: `GM2,3<CR>`
Reply from ESP88: `GM2,3,U<CR>`

1.5 Set Volume Increment/Decrement

Increment or decrement volume of Input/Output channel of slot ***s***, channel ***c***, by ***x*** 0.5dB steps :

SI ***s,c,n,x*** where ***s*** is the slot number, 1 – 8;
c is the channel number, 1 – 8;
n is the up/down: 1 = up, 0 = down
x is the number of 0.5dB steps (e.g., x= 6 for 3dB)

Example*:* Slot 5, ch2, +3dB UP: `SI 5,2,1,6<CR>`
Example: Slot2, ch7, -1.5dB down: `SI2,7,0,3<CR>`

Note: Set Volume commands will be ignored if the channel is muted.

1.6 Get Signal Level (in dBFS)

Get the current signal levels from an input or output card. Returns level in dBFS of all channels on the card. Add 24dB to convert to level in dBu

GL ***s*** where ***s*** is the slot number, 1 – 8;

Response:

GL ***s*** [***a,b,c,d***] where ***s*** is same as above and ***a,b,c, d*** are the values in dBFS of channels 1, 2, 3, 4 on the card. For AES3, the array will have 8 values. The dBFS values are 0 – 78 (hex) where 0=-60dBFS, 1=-59.5dBFS,…77 (hex) = -0.5dBFS, 78 (hex) = 0dBFS

Example Response:

GL 1 [78,1,40,64] slot 1 levels are 0, -59.5, -28, -10 dBFS respectively

1.7 Set/Get Group Master Volume

Set level of Group master (SG command) of number n to level ***l***:

SG ***n,l*** where ***n*** is the group number, 1-1Fh,(1 – 32);
l is the level, 0 – 90h {0 – 144 decimal; 0 = -60dB, 1 = -59.5dB, … 8Fh = +11.5dB, 90h = +12dB}

Get Group master level of Input/Output channel (GG command) of slot ***s***, channel ***c***:

GG ***n*** where ***n*** is the group number, 1-1Fh,(1 – 32);

Response:

GG ***n,l*** where ***nl*** are same as above

1.8 Set Group Master Volume Increment/Decrement

Increment or decrement group master volume (SH command) of group number **m**, by currently defined step size:

SH ***m,n,x*** where ***m*** is the group number, 1-1Fh,(1 – 32);
n is the up/down: 1=up, 0 = down
x is number of 0.5dB steps

Example: Group 5, +3dB UP.
SH5,1,6<CR>
Example: Group7, -1.5dB down
SH7,0,3<CR>

1.9 Set/Get Group Master Mute

Set mute state of Group master (SN command) of group number ***m***:

SN ***m,n*** *where* ***m*** is the group number, 1-1Fh,(1 – 32);
n is the state: M = mute, U = unmute, T = toggle mute state

Get mute state of Group master (GN command) of group number ***m***:

GN ***m*** *where* ***m*** is the group number, 1-1Fh,(1 – 32);

Response:

GN ***m,n*** where ***m,n*** are same as above

2.1 Set/Get Module Parameters

The Set and Get Module parameters commands were added to provide access to any signal processing module. The module is referenced by the user-assignable name given in ControlSpace designer.

Note: Automatic notification on change of a module's parameter is achieved by using "#" as the first character of module name. For example, to automatically receive an update over the serial port whenever the level of a gain block "Hall" is changed (e.g., by a CC-64), name the gain block "#Hall". Each time "Hall" is changed, a "GA" (Get Module Parameter) command will be transmitted over the serial port.

If two modules have the same name, the SA and GA commands will not work. For example, if an output channel is named #Center and an output EQ is also named #Center, neither module will respond to the SA or GA commands.

Command format:

SA **"*module_name*"** > ***index_1*** > ***index_2*** > **…** > ***index_n*** = ***value*****<CR>**

Where ***module_name*** is the text name of signal processing module (e.g., "Pulpit Mic", "CD Left"). *The module name must always be in* ***quotes****, E.g., "#CD Gain" or "MainMatrix"*

index_1	is the index number per the module type (described below) to indicate which parameter is to be changed.
index_n	are additional indices, if necessary, per the module type
value	the value assigned to the parameter.
>	"greater than", ASCII 0x3E. Used as a separator between additional indices.
=	"equal", ASCII '0x3D. Used for assignments of a value.
<CR>	"Carriage return." ASCII 0x0D.
;	"Semicolon" - Used to separate subsequent commands on the same line.

Responses:

ACK (0x06)	Command accepted (acknowledged)
NAK (0x15) $nn	Command not accepted. **nn** is 2-digit error code.

Error Codes:

'01' : Invalid Module Name. Indicated module is not present in target ESP.
'02' : Illegal index. Check index specification and module type.
'03' : Value is out of range. Check value specification and Module type.
'99' : Unknown error.

Example 1. -
Set "CD Gain" gain to –1.5 dB: SA "CD Gain">1=-1.5<CR>

Example 2. –
Set "CD GainL" and "CD GainR" to –15 and –12dB:
SA "CD GainL">1 =-15;"CD GainR">1=-12<CR>

The ESP-88's serial port will also return the string <ACK>

Get Module: GA command is similar to the Set Module but does not include the "=" or an assigned value:

GA ***module_name*** > ***index_1*** > ***index_2*** > ***…*** > ***index_n*****<CR>**

Get Module Command's Response: The GA command returns a string similar to the SA module command:

GA ***module_name*** > ***index_1*** > ***index_2*** > ***…*** > ***index_n*** = ***value*****<CR>**

Example:
Request the value of the "GainCD" Input module.
Command: → GA "#GainCD">3<CR>
Response: → GA "#GainCD">3=-23<CR>

Multi-ESP Serial Communication:

SA and GA serial commands to one ESP will be transmitted to another ESP if prefaced with the '@' symbol and the destination ESP's name.

Examples:
Set the gain of input module "#GainCD" on ESP "Lobby" to -10 while connected to ESP "Main":
SA @ "Lobby" "#GainCD">3=-10

Request the value of the "#GainCD" input module on ESP "Lobby" while connected to ESP "Main":
Command: → GA @ "Lobby" "#GainCD">3
Response: → GA"#GainCD">3=0.0;

Module Indices:

1. INPUT Module

There are a total of 5 parameters which can be set in this module.

			Value	Range
Index 1	**1**	Type	M, L	M=Mic, L=Line
	2	Gain		0,14,24,42,48,54,64
	3	Level	NN.N	-999 to +12.0dB, 0.1dB step
	4	Mute	O,F,T	O=On, Off=F, Toggle=T
	5	Phantom	O,F,T	O=On, Off=F, Toggle=T

***Example 1**:* Set the module "Input1" to gain level -21.

SA"Input1">3=-21<CR>

***Example 2**:* Set the module "Input1" mute state to ON.

SA"Input1">4=0<CR>

2. OUTPUT Module

There are a total of 3 parameters which can be set in this module

			Value	Range
Index 1	**1**	Level	NN.N	-999 to +12.0dB, 0.1dB step
	2	Mute	O,F,T	O=On, Off=F, Toggle=T
	3	Polarity	O,F,T	O=On, Off=F, Toggle=T
	4	*Reserved*		

Example 1: Set the module "Output Main" gain level to -3.5.

SA"Output Main">1=-3.5<CR>

***Example 2**:* Set the module "Output-L" mute state to Off.

SA"Output-L">2=F<CR>

Note: The original Set/Get Volume commands (SV/GV) and Set/Get Mute commands may also be used to control the Input and Output Modules.

3. CROSSOVER Module

There are 3 different segments of this module. Each have a different set of parameters which can be set.

Type of crossover module:
There are a maximum of 4 parameters which can be set in this module.

Type		2Way	3Way	4Way
Index1	**1**	LOW	LOW	LOW
	2	HIGH	MID	MID-1
	3	--	HIGH	MID-2
	4	--	--	HIGH

EQ Band of Crossover module:
There are a maximum of 7 parameters which can be set in this module.

LOW			Value	Range
Index 2	**1**	Type	*1	
	2	Frequency	NN.N	20.0Hz to 20000.0Hz
	3	RESERVED		FUTURE RESERVED
	4	Polarity	O,F,T	O=On, F=Off, T=Toggle
	5	Mute	O,F,T	O=On, F=Off, T=Toggle

HIGH			Value	Range
Index 2	**1**	Type	*1	
	2	Frequency	NN.N	20.0Hz to 20000.0Hz
	3	RESERVED		FUTURE RESERVED
	4	Polarity	O,F,T	O=On, F=Off, T=Toggle
	5	Mute	O,F,T	O=On, F=Off, T=Toggle

MID			Value	Range
Index 2	**1**	Type(HPF)	*1	
	2	Frequency	NN.N	20.0Hz to 20000.0Hz
	3	Type(LPF)	*1	
	4	Frequency	NN.N	20.0Hz to 20000.0Hz
	5	RESERVED		FUTURE RESERVED
	6	Polarity	O,F,T	O=On, F=Off, T=Toggle
	7	Mute	O,F,T	O=On, F=Off, T=Toggle

Example 1: Set the Crossover module “NewArray1”, parameters for the crossover settings of a 3-way, Mid, LPF-Frequency set to 400Hz:

```
SA“NewArray1”>2>4=400<CR>
```

Filter Type settings:
There are a total of 15 different possible settings for the filter types. Each has a different slope.

*1 Filter type descriptions

	Slope	Strings
Butterworth	6dB/oct	**But6**
	12dB/oct	**But12**
	18dB/oct	**But18**
	24dB/oct	**But24**
	36dB/oct	**But36**
	48dB/oct	**But48**
Bessel	12dB/oct	**Bes12**
	18dB/oct	**Bes18**
	24dB/oct	**Bes24**
	36dB/oct	**Bes36**
	48dB/oct	**Bes48**
Linkwitz-Reilly	12dB/oct	**Lin12**
	24dB/oct	**Lin24**
	36dB/oct	**Lin36**
	48dB/oct	**Lin48**

Example 2: Set the Crossover module “NewArray2”, parameters for the crossover settings of a 4-way, High, Frequency set to 1kHz.

```
SA“NewArray2”>4>2=1000<CR>
```

4. 1/3 OCTAVE 31-BAND GRAPHIC EQ Module

Each band can be adjusted individually, with a maximum of 31 bands. There is also a “Bypass all” function added as well. Mute is not yet implemented as a function in the CSD software, although it appears in the chart below for some possible future release.

		Freq	Value	Range
Index 1	**1**	20	+/-NN.N	-15dB to +15dB
	2	25	+/-NN.N	-15dB to +15dB
	3	31.5	+/-NN.N	-15dB to +15dB
	4	40	+/-NN.N	-15dB to +15dB
	5	50	+/-NN.N	-15dB to +15dB
	6	63	+/-NN.N	-15dB to +15dB
	7	80	+/-NN.N	-15dB to +15dB
	8	100	+/-NN.N	-15dB to +15dB
	9	125	+/-NN.N	-15dB to +15dB
	10	160	+/-NN.N	-15dB to +15dB
	11	200	+/-NN.N	-15dB to +15dB
	12	250	+/-NN.N	-15dB to +15dB
	13	315	+/-NN.N	-15dB to +15dB
	14	400	+/-NN.N	-15dB to +15dB
	15	500	+/-NN.N	-15dB to +15dB
	16	630	+/-NN.N	-15dB to +15dB
	17	800	+/-NN.N	-15dB to +15dB
	18	1k	+/-NN.N	-15dB to +15dB
	19	1.25k	+/-NN.N	-15dB to +15dB
	20	1.6k	+/-NN.N	-15dB to +15dB
	21	2k	+/-NN.N	-15dB to +15dB
	22	2.5k	+/-NN.N	-15dB to +15dB
	23	3.15k	+/-NN.N	-15dB to +15dB
	24	4k	+/-NN.N	-15dB to +15dB
	25	5k	+/-NN.N	-15dB to +15dB
	26	6.3k	+/-NN.N	-15dB to +15dB
	27	8k	+/-NN.N	-15dB to +15dB
	28	10k	+/-NN.N	-15dB to +15dB
	29	12.5k	+/-NN.N	-15dB to +15dB
	30	16k	+/-NN.N	-15dB to +15dB
	31	20k	+/-NN.N	-15dB to +15dB
	32	BypassAll	O,F,T	O=On, F=Off, T=Toggle
	33	Mute	O,F,T	O=On, F=Off, T=Toggle

Example: Set the EQ module “GEQ Fitting Room”, parameters for the frequency of 4kHz set to a gain value of -3dB.

SA“GEQ Fitting Room”>24=-3.0<CR>

5. TONE CONTROL EQ Module

Each band can be adjusted individually, with a maximum of 3 bands. There is also a "Bypass" function as well for each band.

			Value	Range
Index 1	**1**	L-Range	+/-NN.N	-15.0dB to +15.0dB 0.1dB step
	2	L-Bypass	O,F,T	O=On, F=Off, T=Toggle
	3	M-Range	+/-NN.N	-15.0dB to +15.0dB 0.1dB step
	4	M-Bypass	O,F,T	O=On, F=Off, T=Toggle
	5	H-Range	+/-NN.N	-15.0dB to +15.0dB 0.1dB step
	6	H-Bypass	O,F,T	O=On, F=Off, T=Toggle

Example: Set the EQ module "Tone" the **-L** meaning the Low Frequency gain, and the bypass parameters for the midrange bypass index number **>4=F** M-Bypass set to Off, and of course the Carriage Return to send this module's output to the device.

SA"Tone-L">4=F<CR>

6. PARAMETRIC EQ Module

Each band can be adjusted individually, with a maximum of 9 bands. There is also a "Bypass" function as well for each band as shown below.

Band Number:
Index 1: This simply corresponds to the Band Number which is 1-9.

Band Parameters and Settings:

			Value	Range
Index 2	**1**	Frequency	NN.N	20.0 to 20000.0Hz
	2	Q	NN.N	0.10 to 10.0, 0.1 step
	3	Gain	+/-NN.N	-20.0dB to +20.0dB, 0.1dB step
	4	Slope	-NN	0,-6,-12dB/oct
	5	Type		*1
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

Band Parameters Functionality Chart:

***1: Parameters are enabled according to Band type**						
Type	**Freq.**	**Q**	**Gain**	**Bypass**	**Slope**	**Strings**
Band	**o**	**o**	**o**	**o**		**B**
High shelf	**o**		**o**	**o**		**HS**
Low shelf	**o**		**o**	**o**		**LS**
High cut (Low pass)	**o**			**o**	**o**	**HC**
Low cut (High pass)	**o**			**o**	**o**	**LC**
Notch	**o**	**o**	**o**	**o**		**N**

Example: Set the EQ module `"RoomEQ",` the parameter set for Band 2, with the Gain set to -1.5dB. This is also the response seen from the serial port's output.

SA"RoomEQ">2>3=-1.5<CR>

7. ROUTER Module

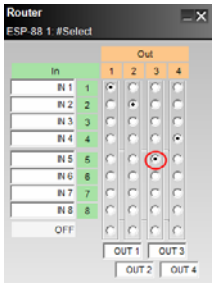
Each crosspoint can be adjusted individually, with a maximum of 16x8 or 8x16 crosspoints.

Index1: Output number: 1-16

Value: Input number: 1-16. Use 0 for "OFF", that is, no input selected.

Example: Set the Router module `"Select".` The module's Output number 3 is set to select Input number 5. See the illustration below.

SA"Select">3=5<CR>



8. GAIN Module

Each gain module can be adjusted individually. Level and mute are the only controls available for this module.

Gain Module Settings:

			Value	Range
Index 1	**1**	Level	NN.N	-999 to +12.0dB, 0.1dB step
	2	Mute	O,F,T	O=On, Off=F, Toggle=T

Example: The gain module named "RoomLevel", has its Level set to -32dB.

SA"RoomLevel">1=-32.0<CR>

Example: The gain module named "RoomLevel", is muted.

SA"RoomLevel">2=O <CR>

9. DELAY Module

Each delay module's taps' delay time can be adjusted individually or bypassed.
Index1: This is simply the module's tap number, 1 through 8.

			Value	Range
Index 2	**1**	Delay time	NNNN	0 to 144000 as number of samples
	2	Bypass	O,F,T	O=Off, F=Off, T=Toggle

Example: "`TimeAlignment`" 4 tap Delay, ch3 set to 54msec.
54msec →0.054 sec→0.054x48000=2592 samples.

```
SA"TimeAlignment">3>1=2592<CR>
```

10. STANDARD MIXER Module

Each mixer module has several parameters which can be adjusted individually. Crosspoints can be set individually or all the crosspoints for a particular input can be set at once. In the tables below, M = input number and N = output number.

			Remarks
Index 1	**1**	Input	Set Input section parameters
	2	Output	Set output section parameters
	3	CrossPoint	Set CrossPoint Value As binary
	4	CrossPoint2	Set CrossPoint value directly

INPUT			Value	Range
Index 2	**1**	Ch1.Level	NN.N	-999 to +12.0dB, 0.1steps
	2	Ch1.Mute	O,F,T	O=On, F=Off, T=Toggle
			:	
	Mx2-1	Ch.M.Level	NN.N	-999 to +12.0dB, 0.1steps
	Mx2	Ch.M.Mute	O,F,T	O=On, F=Off, T=Toggle

Output			Value	Range
Index 2	**1**	Ch1.Level	NN.N	-999 to +12.0dB, 0.1steps
	2	Ch1.Mute	O,F,T	O=On, F=Off, T=Toggle
			:	
	Nx2-1	Ch.M.Level	NN.N	-999 to +12.0dB, 0.1steps
	Nx2	Ch.M.Mute	O,F,T	O=On, F=Off, T=Toggle

Inputs assigned to multiple outputs at once:

CrossPoint			Value	Range
Index 2	**1**	CrossPoint(1)	XXXXXXXX	Hex value of binary on input 1.
	2	CrossPoint(2)	XXXXXXXX	Hex value of binary on input 2.
			:	
	M	CrossPoint(M)	XXXXXXXX	Hex value of binary on input M.

Example calculation of assigned outputs for input 1. In this example, input 1 is assigned to output 1, 6, 9, 12, 15, 18, 21, 22, 23, 24, 27, 28, 29, & 31. The hex value to be used in the Index 3 "CrossPoint" command is: 84924F3A.

	Output channel																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
In 1	O	–	–	–	–	O	–	–	O	–	–	O	–	–	O	–	–	O	–	–	O	O	O	O	–	–	O	O	O	–	O	–
HexValue	8				4				9				2				4				F				3				A			

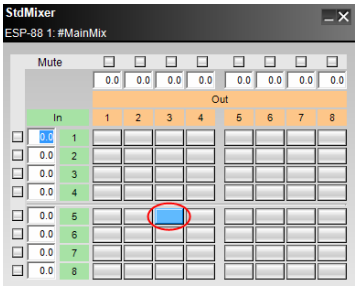
CrossPoint2 is used to change only one crosspoint (input, output).

Example: To set Input 8 to Output 2 to "ON" in MatrixA:

SA"MatrixA">4>(8,2)=0<CR>

Example: "MainMix" Crosspoint(5,3) set to ON

SA"MainMix">4>(5,3)=0<CR>



11. MATRIX MIXER Module

			Remarks
Index 1	**1**	On/Off	Set On/Off
	2	Level	Set Level

On/Off			Value	Range
Index 2	**1**	Cross Point(1,1)	O,F,T	O=On, F=Off, T=Toggle
	2	Cross Point(1,2)	O,F,T	O=On, F=Off, T=Toggle
	Index2 = (M-1)xSizeOfMatrix+N			
	MxN	Cross Point(M,N)	O,F,T	O=On, F=Off, T=Toggle

Level			Value	Range
Index 2	**1**	Cross Point(1,1)	NN.N	-999 to +12.0dB, 0.1steps
	2	Cross Point(1,2)	NN.N	-999 to +12.0dB, 0.1steps
	Index2=(M-1)xSizeOfMatrix+N			
	MxN	Cross Point(M,M)	NN.N	-999 to +12.0dB, 0.1steps

M : Input ch#, N : Output ch#

Example: "MtxMain", 16x16 Matrix, CrossPoint(5, 12) set to "ON", -3dB CrossPoint(5,12)→Index 2 = (5-1)x16+12 =76

SA"MtxMain">1>76=0;"MtxMain">2>76=-3.0<CR>

12. ROOM COMBINER MIXER Module

			Remarks
Index 1	**1**	Room 1	Set Room1 parameters
	2	Room 2	Set Room2 Parameters
		:	
	n	Room n	Set Room n Parameters
	n+1	Separator	Set Separator informations

v.1.2 or older version limit room number as 4.

ROOM			Value	Range
Index 2	**1**	Local In level	NN.N	-999 to +12.0dB, 0.1 step
	2	Local in select	O,F,T	O=On, F=Off, T=Toggle
	3	Global in level	NN.N	-999 to +12.0dB, 0.1 step
	4	Global in select	N	Selected ch #. 0=off

Separator			Value	Range
Index 2	**1**	Separator	O,F,T	O=On, F=Off, T=Toggle
	2	Separator	O,F,T	O=On, F=Off, T=Toggle
		:		
	N-1	Separator	O,F,T	O=On, F=Off, T=Toggle

Example: Open separator between Room3 and 4 at “4F-RoomComb”
SA”4F_RoomComb”>5>3=F<CR>

13. SIGNAL GENERATOR Module

Index 1	**1**	Sine wave
	2	White Noise
	3	Pink Noise
	4	Sweep

Type change

User can change type of noise type between White Noise and Pink noise as below.

To change Pink Noise to White Noise, SA"Gen">1=2<CR>
To change White noise to Pink noise, SA"Gen">1=3<CR>

Sine Wave			Value	Range
Index 2	**1**	Frequency	NN.N	20.0 to 20000.0Hz
	2	Gain	NN.N	-999 to 20.0dB, 0.1 step
	3	Mute	O,F,T	O=On, F=Off, T=Toggle

White Noise			Value	Range
Index 2	**1**	Gain	NN.N	-999 to 20.0dB, 0.1 step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle

Pink Noise			Value	Range
Index 2	**1**	Gain	NN.N	-999 to 20.0dB, 0.1 step
	2	Mute	O,F,T	O=On, F=Off, T=Toggle

Sweep			Value	Range
Index 2	**1**	Gain	NN.N	-999 to 20.0dB, 0.1 step
	2	Slow/Fast	S, F	S=Slow, F=Fast
	3	Repeat	O, F	O=On(repeat), F=off(no repeat)
	4	Start/Stop	O, F	O=On(start), F=Off(stop)

Example: "Gen" Pink noise generator, set gain 0dB and mute off
SA"Gen">3>1=0.0;"Gen">3>2=F<CR>
Example: "Sine" sine generator, set frequency 440Hz, gain -20dB and mute off
SA"Sine">1>1=440.0;"Sine">1>2=-20;"Sine">1>3=F<CR>

14. COMPRESSOR/LIMITER Module

			Value	Range
Index 1	**1**	Detect Input	L,R,M,S	L=Left, R=Right, M=Mix, S=Sidechain
	2	Threshold	NN.N	0 to -40 dBFS 0.5 Step
	3	Ratio	NN.N	1 to 20, 0.1 step
	4	Attack	NNN.N	0.5 to 100ms, 0.5 step
	5	Release	NNNN.N	1 to 1000ms, 0.5 step
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

For a mono COMPRESSOR module, use 'L' to set the detector to the Input Signal and 'S' to set it to the sidechain input.

Example: "SubOutComp", Threshold set to -25dB
SA"SubOutComp">2=-25.0<CR>

15. DUCKER Module

			Value	Range
Index 1	**1**	Reserved		
	2	Threshold	NN.N	0 to -40 dBFS 0.5 Step
	3	Range	NN.N	0 to -70dBFS, 0.5 step
	4	Attack	NNN.N	0.5 to 100ms, 0.5 step
	5	Hold	NNNN.NN	0.02 to 1000ms, 0.02 step
	6	Decay	NNNN	5 to 50000ms, 1 step
	7	Bypass	O,F,T	O=On, F=Off, T=Toggle

Example: “MicDuck”, Decay set to 10000msec
SA”MicDuck”>6=10000<CR>

16. AGC Module

			Value	Range
Index 1	**1**	Detector	L,R,M	L=Left, R=Right, M=Mix
	2	Threshold	NN.N	0 to -40 dBFS 0.5 Step
	3	Reserved		
	4	Reserved		
	5	Reserved		
	6	Bypass	O,F,T	O=On, F=Off, T=Toggle

The mono AGC module does not have a Detector selection.

Example: Set “AGC” threshold set to -25dB: SA”AGC”>2=-25.0<CR>
Example: Toggle “AGC” bypass: SA”AGC”>6=T<CR>

17. GATE Module

			Value	Range
Index 1	**1**	Detector	L,R,M,S	L=Left, R=Right, M=Mix, S=Sidechain
	2	Threshold	NN.N	0 to -40 dBFS 0.5 Step
	3	Range	NN.N	0 to -70dBFS, 0.5 step
	4	Attack	NNN.N	0.5 to 100ms, 0.5 step
	5	Hold	NNNN.NN	0.02 to 1000ms, 0.02 step
	6	Decay	NNNN	5 to 50000ms, 1 step
	7	Bypass	O,F,T	O=On, F=Off, T=Toggle

For a mono GATE module, use ‘L’ to set the detector to the Input Signal and ‘S’ to set it to the sidechain input.

Example: “Gate3” Depth change to -42dBFS
SA”Gate3”>3=-42.0<CR>

18. SOURCE SELECTOR Module

Index 1: 1, Value: channel #.

Example: Set source selector “CounterSource” to channel 5.
SA“CounterSource”>1=5<CR>

19. SURROUND Module

			Value	Range
Index 1	**1**	Input Source	O,C	O=Optical, C=Coaxial
	2	Output Format	N,	N=No Signal, PCM16=PCM, DD51=Dolby5.1, DTS51=DTS5.1, ES61D=DTS6.1 Discrete ES61M=DTS6.1 Matrix DD1=Dolby1.0, DD2=Dolby2.0, DTS1=DTS1.0, DTS2=DTS2.0, DTS21=DTS2/1, DTS30=DTS3.0, DTS40=DTS4.0, DTS50=DTS5.0
	3	Room Type	S,L,N	S=Small, L=Large, N=None
	4	Left Front Level	N.NN	-60.5 to 12.0
	5	Right Front Level	N.NN	-60.5 to 12.0
	6	Left Surround Level	N.NN	-60.5 to 12.0
	7	Right Surround Level	N.NN	-60.5 to 12.0
	8	Center Level	N.NN	-60.5 to 12.0
	9	LFE (Sub) Level	N.NN	-60.5 to 12.0
	10	Back Surround Left Level	N.NN	-60.5 to 12.0
	11	Back Surround Right Level	N.NN	-60.5 to 12.0

Examples:

Select the optical source: SA”#Surround 1”>1=O
Select the coaxial source: SA” #Surround 1">1=C
Set the output format to DTS 5.1: SA”#Surround 1”>2=DTS51
Set room type to small: SA”#Surround 1”>3=S
Set Left Front gain: SA"#Surround 1">4=12.0
Set Right Front gain: SA"#Surround 1">5=12.0;

20. AUTOMATIC MIC MIXER Module

Index 1	**0**	Output
	1	Input1
	2	Input2
	3	Input3
	4	Input4
	5	Input5
	6	Input6
	7	Input7
	8	Input8

Index 2 for Output				
			Value	Range
Index 2	**1**	Gain	NN.N	-999 to 0.0 dB
	2	NOM	O,F,T	O=On, F=Off, T=Toggle
	3	Mute	O,F,T	O=On, F=Off, T=Toggle

Index2 for Input *N*				
			Value	Range
Index 2	**1**	Priority	O, F, T	O=On, F=Off, T=Toggle
	2	Gain	NN.N	.-999 to 0.0 dB
	3	Detection	N	1=Threshold, 2=LastOn, 3=PushToTalk, 4=Bypass
	4	Threshold	NN.N	.-80.0 to 0.0 dB
	5	Gate Depth	NN.N	.-70.0 to 0.0 dB
	6	Hold	NN.N	1.0 to 50000.0 ms
	7	Ducking Depth	NN.N	.-60.0 to 0.0 dB
	8	Decay	NN.N	5 to 50000 ms
	9	Reserved		
	10	High Pass	NN.N	20.0 to 1000.0 Hz
	11	Low Pass	NN.N	1000.0 to 20000 Hz
	12	RMS Avg.	NN.N	0.0 to 500.0 ms
	13	Reserved		
	14	Attack	NN.N	0.5 to 100.0 dB
	15	Push to Talk	O, F, T	O=On, F=Off, T=Toggle
	16	Mute	O, F, T	O=On, F=Off, T=Toggle

Example: Set threshold of Input2 to -55dB on AutoMicMix module “AMM1”,
SA “AMM1”>2>4=-55

Example: Set Input 8 of "AMM1" to Bypass detection mode:
SA "AMM1">8>3=4

2.2 AMX Device Discovery Response

When receive Device Discovery PING ("AMX<CR>")
ESP will send,
AMXB<-SDKClass=AudioProcessor><-Make=BOSE><-Model=ESP88><Revision=1.2.0><CR>
Where <CR>= 0x0D

Example, at version 1.2 of firmware,
AMX device->ESP88
AMX<CR>
ESP88 -> AMX device
AMXB<-SDKClass=AudioProcessor><-Make=BOSE><-Model=ESP88><Revision=1.2.0><CR>

2.3 Set/Get IP Address

The Set and Get IP address commands were added to provide access to the IP address when not connected to an ESP via the LAN connection, or when scanning for ESPs on the wrong network.

Note: When using the set IP address command, the IP address will ***not*** be changed until the ESP-88 is power cycled.

Command format:
Set IP address: IP "xxx.xxx.x.xxx"<CR>
Get IP address: IP <CR>

Examples:
Request the current IP address of the ESP-88
Command: → IP
Response: → IP 192.168.0.160
Set the IP address of the ESP-88 to "192.168.0.165"
Command: → IP 192.168.0.165

3. Revision History

v1.1
- added increment amount to set volume Increment/Decrement
- added comma delimiters between parameters and space after command
- added command format section (3).

v1.2 (requires firmware version 3135 or greater)
- Set/Get volume parameter range changed to "0- 90h" from "1-90h"

v1.3 (requires firmware version 3240 or greater)
- Added Get Level (in dBFS) command

v1.4 (requires firmware version 1.1 or greater)
- added Set Group volume commands
- added start-up strings when ESP boots.
- added comment re: crossover cable needed to connect PC.

v2.0
- Added SA, GA command and description of each algorithm.
- Added AMX device discovery command

v2.3
- Removed Speaker EQ & Meter from SA/GA commands
- Added type change of signal generator in SA/GA command.
- Change Error codes. (‘00’ ->’01’, ‘01’ -> ‘02’, ‘02’ ->’03’)

v2.3d November 9, 2007
- Removed ‘#’ from the examples. In general, you would not use ‘#’ in most commands since ‘#’ is only needed on those modules for which you want automatic feedback.
- Clarified that quotation marks ‘”’ are required on all module names.

v2.4 December 3, 2007
- Added 4.8 & 4.9 Group Master volume Increment/Decrement & Mute

v2.4b March 17, 2008
- Various text changes

v2.5 July 7, 2008, requires firmware 2.040 or later
- Added surround module & automatic mic mixing module commands
- Added multi-ESP addressing

v2.6 September 25, 2008, requires firmware 2.050 or later
- Added IP address commands
- Added two surround module commands (Index 2&3)

v2.6a February 20, 2009
- Noted SA/GA commands won't work when 2 modules have same name
- Added firmware versions required to the change history

v2.6b March 17, 2009, requires firmware 2.075 or later
- Added Serial-over-Ethernet connection details
- Various text and formatting changes